## AMENDMENTS TO THE SPECIFICATION

### ABSTRACT

Methods and apparatuses for the application of image intensity and luminance adjustment and gamma adjustment for the purpose of compensating perceived image brightness. ~~Thereby~~ , and thus enhancing the range of display backlight brightness adjustment that may be applied to conserve power, while minimizing impact to image color shade, hue or saturation characteristics.

**[0004]** Display image quality is further affected ~~effected~~ by ambient light surrounding the display, which can reduce the environments in which a user may feel comfortable using a battery powered device that adjusts the backlight to save power, which is especially important considering the self-contained battery power-source is one of the key factors facilitating mobility that allows the use to move at will between different indoor and outdoor environments.

**[0006]** The image adaptation technique described herein can be applied to a broad class of electronic systems having associated display devices. While the examples herein are ~~a~~ generally directed to laptop computers, the techniques described can be applied to personal digital assistants (PDAs), palm top computers, desktop computers using flat panel displays, kiosk displays, etc. **Figure 1** is a block diagram of one embodiment of an electronic system. Electronic system 100 includes processor 102 coupled to bus 105. In one embodiment, processor 102 is a processor in the Pentium® family of processors including the Pentium® II processor family, Pentium® III processors, Pentium® 4 processors, and Pentium-M processors available from Intel Corporation of Santa Clara,

California. Alternatively, different and/or other processors may be used, such as Intel's StrongArm processor, XScale processor, ARM processors available from ARM Ltd. of Cambridge, the United Kingdom, or OMAP processor (an enhanced ARM-based processor) available from Texas Instruments, Inc., of Dallas, Texas.

**[0012]** **Figure 2** illustrates a cross-section of one embodiment of a flat-panel display monitor 200. In one embodiment, display signals 205 generated by a display device, such as a graphics accelerator, are interpreted by flat-panel monitor control device 210 and subsequently displayed by enabling pixels within flat-panel monitor screen 215. The pixels are illuminated by backlight 220, the brightness of which effects the brightness of the pixels and therefore the brightness of the displayed image.

**[0022]** In general an image to be displayed on flat-panel monitor 595 is communicated via display signals 555 ~~505~~, which enable timing controller 560 to activate appropriate column and row drivers 590 and 592, respectively, to display an image on flat-panel monitor 595. In one embodiment, blender unit 515 creates an image to be displayed on the display monitor by combining a display image with other display data, such as texture(s), lighting, and/or filtering data. These techniques are known in the art.

**[0023]** In one embodiment, the display image from blender unit 515 ~~530~~ and the output of gamma unit 525 ~~545~~ are combined generate display signals 555 ~~505~~, which are transmitted to timing controller 560 ~~510~~, as discussed above. Graphics gamma unit 525 ~~545~~ determines the brightness (luminance) of pixels in an image to be displayed by scaling each sub-pixel color. In one embodiment, graphics gamma unit 525 ~~545~~ can be

programmed to scale the sub-pixel color on a per-pixel basis in order to achieve greater luminance in some areas of the display image, while reducing the luminance in other areas of the display image.

**[0024]** In one embodiment, display image brightness indicators 510 ~~550~~ include data indicating image brightness determined by monitoring and accumulating pixel color within the display image. The display image brightness indicators 510 can then indicate to image brightness agent 520 the brightness of certain features within the display image, such as display image character and background brightness.

**[0026]** Arithmetic unit 550 is coupled to receive a value stored in legacy backlight control register 540 and from multiplexor 545 (i.e., either the preset brightness value or the value stored in legacy backlight control register 530). Arithmetic unit 550 ~~530~~ combines the values received from backlight control register 540 and multiplexor 545 to generate a backlight control value that is stored in duty cycle register 570. In one embodiment, a duty cycle of a pulse width modulated (PWM) signal is modified to cause a corresponding modification to the backlight intensity. In alternate embodiments, other techniques can be used to modify backlight intensity.